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Original Article

Breast pumps as an incentive for breastfeeding: a mixed methods study of acceptability

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Abstract

Increasing breastfeeding rates would improve maternal and child health, but multiple barriers to breastfeeding persist. Breast pump provision has been used as an incentive for breastfeeding, although effectiveness is unclear. Women's use of breast pumps is increasing and a high proportion of mothers express breastmilk. No research has yet reported women's and health professionals' perspectives on breast pumps as an incentive for breastfeeding. In the Benefits of Incentives for Breastfeeding and Smoking cessation in pregnancy (BIBS) study, mixed methods research explored women's and professionals' views of breast pumps as an incentive for breastfeeding. A survey of health professionals across Scotland and North West England measured agreement with 'a breast pump costing around £40 provided for free on the NHS' as an incentive strategy. Qualitative interviews and focus groups were conducted in two UK regions with a total of 68 participants (pregnant women, new mothers, and their significant others and health professionals) and thematic analysis undertaken. The survey of 497 health professionals found net agreement of 67.8% (337/497) with the breast pump incentive strategy, with no predictors of agreement shown by a multiple ordered logistic regression model. Qualitative research found interrelated themes of the 'appeal and value of breast pumps', 'sharing the load', 'perceived benefits', 'perceived risks' and issues related to 'timing'. Qualitative participants expressed mixed views on the acceptability of breast pumps as an incentive for breastfeeding. Understanding the mechanisms of action for pump type, timing and additional support required for effectiveness is required to underpin trials of breast pump provision as an incentive for improving breastfeeding outcomes. © 2016 The Authors. Maternal & Child Nutrition published by John Wiley & Sons Ltd.

Keywords: Incentives, breastfeeding, breast milk expression, breast pump, acceptability.

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Background

Over the last 30 years, the number of women initiating breastfeeding in high-income countries has steadily increased, but this is typically not sustained in the weeks and months post-partum (Australian Institute of Health and Welfare 2011; Center for Diseases Control 2014; McAndrew *et al.* 2012). Breastfeeding maintenance rates are unevenly distributed across the socioeconomic and demographic spectrum. For example, a UK survey in 2010 reported that 46% of mothers in the most socio-economically deprived quintile were breastfeeding at 6 weeks compared with 65% in the least deprived, and

24% of mothers aged under 20 years were breastfeeding at 6 weeks compared with 67% of those aged 35 or over (McAndrew *et al.* 2012). Because increasing breastfeeding rates could reduce maternal and child morbidity and mortality and save health costs, breastfeeding is the target of policy initiatives and research, but individual, family, societal and health service barriers make increasing breastfeeding rates an ongoing challenge (Renfrew *et al.* 2012).

The expression of breast milk has become more prevalent in recent years, although few studies have quantified the increase (Johns *et al.* 2013). A recent survey in Australia found that 98% of

respondents had expressed milk (Clemons & Amir 2010). Systematic review evidence on the effectiveness of different methods of expressing milk focuses on sick or preterm infants, and reported greater expressed milk volumes when mothers were given an audio relaxation recording, with warming or massage of the breast, and with early initiation of milk pumping. No consistent difference in milk volume was found between the pumps studied (Becker *et al.* 2015). Qualitative and survey investigation of perspectives around breast milk expression reveals that it is seen as a way of mitigating pain and/or breastfeeding problems, concerns about not having enough milk, managing breastfeeding in public, negotiating separation from the baby and imposing 'control' on an ungovernable biological process (Dykes 2005; Johns *et al.* 2013; Johnson *et al.* 2009; Johnson *et al.* 2013; Ryan *et al.* 2013).

The use of incentives to change health behaviours is becoming increasingly common in health services policy and research, and there is some evidence to support their effectiveness for specific health behaviours (Giles *et al.* 2014). A systematic review of the effectiveness of incentive interventions for breastfeeding, conducted as part of the mixed methods Benefits of Incentives for Breastfeeding and Smoking cessation in pregnancy (BIBS) study, found 16 studies evaluating multi-component interventions, mostly from the US (14 studies). The most commonly used incentive (six studies) was providing access to a breast pump, but evidence of effectiveness was inconclusive (Moran *et al.*, 2015). No qualitative studies reporting the views of women and healthcare professionals on the use of breast

pumps as an incentive were identified (Moran *et al.*, 2015). A recent qualitative study reported equivocal views on the acceptability of financial incentives for breastfeeding (Whelan *et al.* 2014), while a thematic analysis of online readers' comments to media coverage of a UK feasibility study of financial incentives for breastfeeding found this strategy largely unacceptable (Giles *et al.* 2014). As part of the BIBS study we investigated general public opinion of incentives for breastfeeding in a survey of 1144 British adults. Respondents were asked about the acceptability of a shortlist of seven promising incentive strategies for breastfeeding and smoking cessation in pregnancy, and found highest levels of agreement were for a free breast pump worth around £40 to help women with breastfeeding (Hoddinott *et al.* 2014). The six comparison incentive strategies included shopping voucher incentives for breastfeeding; smoking cessation in pregnancy, after birth or maintaining a smoke free home and local health service provider incentives for meeting breastfeeding or smoking cessation targets. Overall, agreement with the breast pump incentive strategy was 46% and net disagreement 28%. Agreement with a free breast pump was higher among respondents of childbearing age, those with higher level of educational qualifications and those with a breastfed child (Hoddinott *et al.* 2014).

Given the findings (Moran *et al.*, 2015), it is important to gain insights into women's and professionals' perceptions, views and experiences to inform intervention design. In this paper we present findings from the BIBS study about the acceptability of breast pumps as an incentive to maintain breastfeeding.

Key messages

- Breast pumps are widely acceptable for women and healthcare professionals as an incentive for breastfeeding.
- The appeal of breast pumps relates to their financial value, their perceived benefit in reducing barriers to breastfeeding and their potential to allow mothers to share infant feeding.
- There were concerns about the potential risks of breast pumps, and uncertainty as to appropriate timing of breast pump provision.
- Before breast pumps are offered as an incentive, a better understanding of the mechanisms of action for improving breastfeeding outcomes in terms of the type of pump, the timing, frequency of use and the nature of any support or additional intervention components is required.

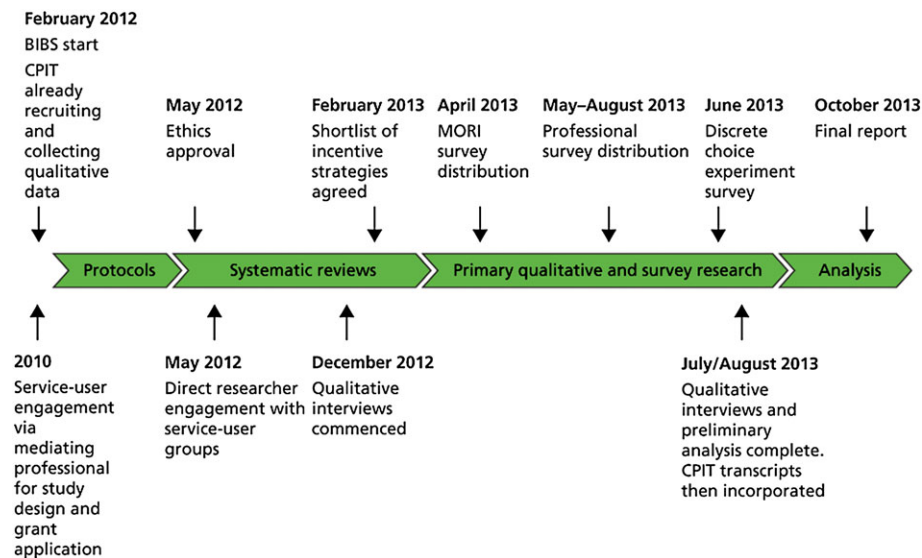


Fig. 1. Timeline of the BIBS study phases. Reproduced from NIHR HTA journal, 19:30.

Participants and methods

Study context and settings

This research formed part of the larger mixed methods, multiphase BIBS study investigating incentives for breastfeeding and smoking cessation in pregnancy (Morgan et al., 2015). There were three overlapping phases to the study, outlined in Fig. 1. Phase One of the study comprised evidence syntheses, Phase two comprised surveys of the general public and of health professionals, and qualitative research and Phase Three a discrete choice experiment. The study included service-user involvement throughout all three phases via input from a mother-and-baby group based in each study region (described in detail in Morgan et al., 2015). Here we report data from Phase Two: qualitative and survey research undertaken in Scotland and North West England. These locations were chosen for their lower than UK average breastfeeding rates, their differing experiences of incentive programmes for the target behaviours (incentive programmes for both smoking cessation, and breastfeeding, had recently been implemented in the areas of North West England where the study took place), and different devolved health service cultures. Incentives were defined as ‘financial

(positive or negative) and non-financial tangible incentives or rewards, such as free or reduced cost items or services that have a monetary or an exchange value’.

Survey design and data collection

The study population was primary and secondary care health professionals across Scotland and North West England whose role related to care of pregnant and/or postnatal women and/or infants. This comprised maternity unit staff, health visiting staff, obstetricians, paediatricians, public health specialists, general practitioners, practice nurses and policy makers. Full details of how we accessed email lists to the relevant health professionals are provided elsewhere (Morgan et al., 2015).

The survey investigated the acceptability of seven promising incentive strategies for either smoking cessation in pregnancy, or breastfeeding. These were: (1) shopping vouchers for women who prove that they have stopped smoking during pregnancy; (2) shopping vouchers for a woman for two months after the birth of her baby if she proves that she is still not smoking; (3) shopping vouchers for a woman for two months after the birth of her baby if she never lets anyone smoke in her home; (4) shopping vouchers for women who prove that they are breastfeeding for the first 6 months

after birth; (5) a breast pump costing around £40 provided for free on the NHS; (6) additional funding for local health services if they reach targets for the number of women who prove that they have stopped smoking during pregnancy; and (7) additional funding for local health services if they reach targets for the number of women who prove that they are breastfeeding. This short list of strategies was developed from systematic reviews, service user involvement and the initial phase of the qualitative research (Morgan et al., 2015). Agreement with each statement was measured using a five-point Likert scale. In this paper we report on respondents' agreement with the statement 'A breast pump costing around £40.00 should be available for free on the NHS, to help women to continue breastfeeding'.

Survey data analysis

An a priori target sample size of 1000 was set to allow the estimation of proportions within 3% with 95% confidence. A priori questions asked:

1. Is the acceptability of a breast pump as an incentive for breastfeeding influenced according to sex; age (categories 18–24, 25–34, 35–44, 45–54, 55–59, 60–64, 65 and over); ethnicity; having children (yes, no); had a child ever been breastfed (even if for only a day or two); job; survey region?
2. What are the independent predictors of acceptability of a breast pump as an incentive?

Data were described using the appropriate summary statistics. Responses to the Likert scales for agreement with survey questions were summarised by number, percentage and mean. Net agreement (agree and strongly agree) and net disagreement (disagree and strongly disagree) were reported as number and percentage. Independent predictors of acceptability were ascertained using simple and multiple ordered logit regression models. The relationship between predictor and outcomes variables was presented using the odds ratio and 95% confidence intervals. For all models, the reference categories used were male; white ethnicity; doctor; no children; child breastfed. Age was entered as 5-year categories. Stata 13 (StataCorp. 2013.

Stata Statistical Software: Release 13. College Station, TX: StataCorp LP) was used for all analyses.

Qualitative research recruitment and data collection

Qualitative interviews (individual, group) and focus groups were undertaken with pregnant women, new mothers and their significant others; healthcare professionals, including midwives, health visitors, obstetricians, paediatricians, public health specialists, general practitioners, practice nurses; and experts and decision-makers such as government policy-makers, research ethics and governance staff, expert advisers and voluntary sector staff. Focus groups could contain more than one type of participant. Interactive discussions were conducted with conference attendees at two infant feeding conferences. We used purposive sampling and 'snowball' techniques to obtain a socio-demographically diverse sample of women and significant others, including harder-to-reach, disadvantaged participants who were more likely to smoke and to not breastfeed. Participants were recruited from health, local authority, community and voluntary sector services (e.g. antenatal clinics, children and family centres; mother and baby groups). Sampling ceased when data saturation was reached when no new data was forthcoming for key analytical themes and when sample diversity was considered to include a priori specified groups in the study protocol (Morgan et al., 2015).

Three researchers (one in north-east Scotland and two in north-west England) conducted interviews and focus groups between June 2012 and August 2013. Interviews ranged from ~15 to 100-min duration (interview duration was determined by the participant) and were audio-recorded and transcribed. Unrecorded discussions with mother-and-baby group members gathered as part of the service user involvement throughout the study and researcher reflexive diaries were also used. A topic guide was developed based on systematic review findings (Morgan et al., 2015) and service user input, and refined as the study progressed. Participants were asked what types of items or services they considered could constitute an incentive for breastfeeding. Vignettes describing published reports of trials of incentives for the target behaviours

were used in interviews and focus groups to prompt discussion; one of these described an electric breast pump offered as an incentive for breastfeeding (Chamberlain *et al.* 2006) (see Supporting Information). Where used, vignettes were introduced part way through interviews and focus groups so that unprompted views could be gained first.

Qualitative data analysis

NVIVO 10 software (QSR International, Burlington MA) was used to organise, code and retrieve qualitative data. Data were entered on two sites and datasets merged at 2 to 4 weekly intervals. The researchers listened to and read the first four participant and four provider interviews/transcripts, and then agreed a single tree structure coding index. Coding was carried out with frequent discussion between sites to ensure consistency, develop themes and look for disconfirming perspectives. Breast pumps were frequently discussed as an incentive for breastfeeding, either spontaneously by participants or in reference to the vignette. A further iteration of the thematic analysis specifically exploring participants' views related to breast pumps was undertaken for the current paper (Braun & Clarke 2006).

Researcher reflexivity was critically considered at each stage of the study. Some researchers had prior experience of researching incentives for breastfeeding; the team included researchers with and without children and mixed experience of breast and formula feeding.

Ethics

Full National Research Ethics Service (NRES) and local ethics approval and Research and Development permissions were obtained (North of Scotland Research Ethics Committee (NOSRES, reference number: 12/NS/0041), University of Central Lancashire (BUSH064) and Research and Development, NHS Grampian).

Results

Survey

Five hundred and 19 health professionals responded to the survey. Twenty-two (4.2%) did not respond to the survey questions relating to the acceptability of

incentive strategies and these were excluded from all analyses. The extensive missing data on other survey questions also meant we could not make comparisons between included and excluded respondents. The characteristics of the 497 included respondents are shown in Table 1. Most responses came from midwives (121/497; 24%) and GPs (132/497; 27), 411 (83%) were women, and 437 (88%) were based in Scotland.

The net disagreement was 21.9% (109/497) and net agreement 67.8% (337/497) with the incentive strategy of a free breast pump worth £40. Statistical models found no predictors of agreement. Odds ratios are presented for age, breastfeeding experience, having children, ethnicity, sex and job in relation to the reference categories: 55 and over (age), no children breastfed, no children, white ethnicity, male sex, doctor, never smoked and working in Scotland. See Tables 2 and 3.

Qualitative findings

Characteristics of the qualitative study participants are shown in Table 4.

When reporting the findings below we use the collective term 'participant' within the text to indicate that all participant groups (women or professionals) provided similar comments, and where points were made by certain groups in particular, this is made explicit. The qualitative findings are supported by quotations from participants followed by a reference to provide context, for example (FG1, I, professionals). The first code is the participant ID number preceded by letters that relate to whether the participant took part in a focus group (FG), interactive discussion (IA), telephone interview (T), survey (S) or face-to-face interview (no letter). The presence of an 'I' relates to whether the participant was or had been involved in programme which included a health incentive (as a recipient in the case of women or in delivering incentives in the case of professionals), and the last code gives a narrative description of who the participant is.

We identified five interrelated themes: the appeal and value of breast pumps; sharing the load; the perceived potential of breast pumps to remove barriers to breastfeeding; potential risks and issues related to timing.

Table 1. Characteristics of the health professional sample (n = 497)

Variable	Classes	Sample (%)
Sex	Male	64 (12.9)
	Female	411 (82.7)
	Missing	22 (4.4)
Age	18–34	91 (18.3)
	35–44	114 (22.9)
	45–54	182 (36.6)
	55>	85 (17.1)
	Missing	25 (5.0)
Ethnicity	White	444 (89.3)
	BME/prefer not to say	53 (10.7)
	White British	339 (68.2)
	White Irish	7 (1.4)
	White Other	1 (0.2)
	Mixed W/B Caribbean	1 (0.2)
	Mixed Other	1 (0.2)
	Asian—Indian	10 (2.1)
	Asian—Pakistani	2 (0.4)
	Chinese	1 (0.2)
	Black African	2 (0.4)
	Declined to answer	35 (7.0)
Smoking status	Never smoked	370 (74.5)
	Current smoker, tried to stop smoking	17 (3.4)
	Current smoker, not tried to stop smoking	1 (0.2)
	Ex-smoker	101 (20.3)
	Declined to answer	8 (1.6)
Any children	Yes	401 (80.7)
	No	96 (19.3)
Breastfeeding	Any children breastfed	387 (77.9)
	No children breastfed	110 (22.1)
Job	General Practitioner	132 (26.6)
	Health visitor	47 (9.5)
	Manager	20 (4.0)
	Midwife	121 (24.4)
	Obstetrician	12 (2.4)
	Maternity staff	29 (5.8)
	Paediatrician	12 (2.4)
	Other nurse	41 (8.3)
	Public health staff	32 (6.4)
	AHP	18 (3.6)
	Support role	8 (1.6)
	Researcher	4 (0.8)
	Missing	21 (4.2)
Survey region	England	60 (12.1)
	Scotland	437 (87.9)

BME, black and minority ethnic group.

Appeal and value

Some women were enthusiastic about the idea of a free breast pump, describing it as a ‘brilliant’ incentive. For both women and professionals, it was the practical

application of breast pumps as a behaviour aid – the fact that they are ‘related to breastfeeding isn’t it, rather than the incentives just being a treat’ – that made them an acceptable incentive for breastfeeding:

‘Perhaps that is a little bit more acceptable because it’s helping them to do it rather than just giving them money’ (53, midwife)

Some suggested that ‘if it’s someone who is already thinking that they might like to [breastfeed] then that is a really good incentive’. Other women felt that a breast pump would only hold appeal for those who were already motivated to breastfeed, and would not incentivise those who were not:

‘Some people may like the idea of being given a breast pump but it wouldn’t make me breastfeed’ (FG, mothers)

Similarly, it was recognised that breastfeeding is a complex behaviour with multiple individual and social influences. Participants highlighted the need for other breastfeeding support beyond the provision of a breast pump, particularly if problems were encountered:

‘If a woman’s going to give up breastfeeding, you know. They’re not, that’s not going to keep them breastfeeding’ (FG13, professionals)

Some professionals suggested that breast pumps may not be suitable as a universal incentive, because some women with older children might already own a pump. It was observed that ‘there is some mums that just can’t use those pumps’. In addition, some women expressed doubts about their usefulness based on their own experiences of trying to use them:

‘I have got three children and I had a breast pump and I just got about one ounce out and I tried lots of different ones’ (FG8, mothers)

Breast pumps were perceived to be expensive items, either to buy or to hire, which ‘when you’ve got a new baby, is money you really can’t afford to spend’. Their financial value was another often mentioned reason for the appeal of breast pumps:

‘If you’re breastfeeding you get a pump that you might not be able to afford, that’s great’ (1, mother)

However, the cost of breast pumps gave some participants misgivings: pumps are a specialised item with no

Table 2. Health professionals' survey response to 'A breast pump costing around £40.00 should be available for free on the NHS, to help women to continue breastfeeding', by independent variable

Variable	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Age category (years)					
18–34	5 (5.5%)	12 (13.2%)	6 (6.6%)	38 (41.8%)	30 (33.0%)
35–44	5 (4.4%)	14 (12.3%)	15 (13.2%)	53 (46.5%)	27 (23.7%)
45–54	9 (4.9%)	32 (17.6%)	20 (11.0%)	74 (40.7%)	47 (25.8%)
55+	6 (7.1%)	17 (20.0%)	8 (9.4%)	30 (35.3%)	24 (28.2%)
Missing	4 (16.0%)	5 (20.0%)	2 (8.0%)	9 (36.0%)	5 (20.0%)
Breastfeeding					
Children not breastfed	5 (4.5%)	21 (19.1%)	11 (10.0%)	48 (43.6%)	25 (22.7%)
Children breastfed	24 (6.2%)	59 (15.2%)	40 (10.3%)	156 (40.3%)	108 (27.9%)
Children					
No children	5 (5.2%)	17 (17.7%)	11 (11.5%)	42 (43.8%)	21 (21.9%)
Have children	24 (6.0%)	63 (15.7%)	40 (10.0%)	162 (40.4%)	112 (27.9%)
Ethnicity					
White	22 (5.0%)	72 (16.2%)	45 (10.1%)	185 (41.7%)	120 (27.0%)
Other ethnicity	7 (13.2%)	8 (15.1%)	6 (11.3%)	19 (35.8%)	13 (24.5%)
Sex					
Male	3 (4.7%)	10 (15.6%)	10 (15.6%)	22 (34.4%)	19 (29.7%)
Female	22 (5.4%)	66 (16.1%)	38 (9.2%)	176 (42.8%)	109 (26.5%)
Missing	4 (18.2%)	4 (18.2%)	3 (13.6%)	6 (27.3%)	5 (22.7%)
Profession					
Doctor	8 (5.1%)	27 (17.3%)	17 (10.9%)	68 (43.6%)	36 (23.1%)
Midwife/health visitor/maternity care	10 (5.1%)	36 (18.3%)	20 (10.2%)	74 (37.6%)	57 (28.9%)
Other	11 (7.6%)	17 (11.8%)	14 (9.7%)	62 (43.1%)	40 (27.8%)
Smoking status					
Never smoked	23 (6.3%)	59 (16.0%)	39 (10.6%)	156 (42.4%)	91 (24.7%)
Previous smoker/current smoker/declined to answer	6 (4.7%)	21 (16.3%)	12 (9.3%)	48 (37.2%)	42 (32.6%)
Area					
North	28 (6.4%)	72 (16.5%)	45 (10.3%)	178 (40.7%)	114 (26.1%)
North West	1 (1.7%)	8 (13.3%)	6 (10.0%)	26 (43.3%)	19 (31.7%)

other uses and as noted by many participants, not all women are able to use them. This, combined with their costliness, raised the issue of potentially wasted resources: *'they could be spending that money on something that gets shoved in the cupboard'*. It was also suggested by some participants that pumps might not be used for their intended purpose, but sold or exchanged: *'I think they'd sell them on eBay'*.

Removing barriers

Some participants considered that breast pumps could *'get rid of the barriers'* to breastfeeding, and this perception appeared in various contexts. A few younger women believed that access to a pump might have prolonged their breastfeeding experience or enabled

them to provide breast milk even if they were no longer feeding their baby at the breast:

'If I'd have had a breast pump, I'd have carried on breastfeeding, but I didn't have a breast pump' (FG3, mothers).

Some women believed that breast pumps might be helpful in establishing breastfeeding, perhaps reflecting fears about their capacity to produce enough milk for their baby:

'If they had supplied breast pumps at the hospital it would help you get going a bit better maybe' (FG7, mothers)

Other women suggested that a breast pump could provide a middle ground between breastfeeding and formula feeding, where if difficulties with breastfeeding

Table 3. Simple univariable and multiple ordered logit regression models for response to 'A breast pump costing around £40.00 should be available for free on the NHS, to help women to continue breastfeeding'

Variable	Simple regression model			Multiple regression model		
	OR	95% CI	P value	OR	95% CI	P value
Age category						
18–34	1.48	(0.86, 2.57)	0.16	1.69	(0.94, 3.02)	0.077
35–44	1.13	(0.68, 1.89)	0.63	1.19	(0.70, 2.01)	0.52
45–54	1.06	(0.66, 1.70)	0.82	1.04	(0.64, 1.68)	0.87
Missing	1.48	(0.86, 2.57)	0.16	0.98	(0.23, 4.15)	0.97
Breastfeeding						
Children breastfed	1.16	(0.79, 1.70)	0.44	0.96	(0.34, 2.69)	0.94
Children						
Have children	1.20	(0.80, 1.79)	0.37	1.41	(0.47, 4.19)	0.54
Ethnicity						
Other ethnicity	0.71	(0.42, 1.21)	0.21	0.88	(0.45, 1.75)	0.72
Sex						
Female	1.00	(0.62, 1.63)	0.99	0.90	(0.54, 1.52)	0.70
Missing	0.49	(0.20, 1.23)	0.13	0.51	(0.11, 2.49)	0.41
Job						
Midwives/health visitors/maternity care	1.13	(0.77, 1.65)	0.54	1.16	(0.75, 1.79)	0.50
Other	1.20	(0.80, 1.81)	0.38	1.32	(0.84, 2.06)	0.23
Smoking status						
Previous smoker/current smoker/declined to answer	1.28	(0.89, 1.86)	0.19	1.24	(0.85, 1.81)	0.27
Area						
England	1.43	(0.88, 2.33)	0.15	1.49	(0.90, 2.47)	0.13

OR is odds ratio; CI is confidence interval; simple univariable regression models included only the categories for that variable; multiple regression include all variables. Reference categories were 55 and over (age), no children breastfed, no children, white ethnicity, male sex, doctor, never smoked and Scotland.

could not be overcome, then 'you'd be more likely to use [a pump] than to think, oh I'll put him on bottles'.

Similarly, some professionals thought that feeding expressed milk might be more acceptable to women who find the thought of feeding the baby at the breast distasteful:

I think that might encourage some breastfeeding because I think a lot of people don't want to put babe to breast, there is still that feeling of "This is not for me". (52, midwife)

Fears around breastfeeding outside the home were often cited as a barrier to breastfeeding with feeding expressed breast milk considered by some participants to be a solution to this common predicament. Provision of a pump, therefore, 'would be useful for those that don't breastfeed in public' and could prevent women from feeling confined to home: 'you think you're going to be trapped in'.

Paid employment was often mentioned as another potential barrier to breastfeeding – 'these days you have

more often than not working mums that are going back to work' – and it was suggested that provision of a breast pump might encourage more women to sustain breastfeeding. Some pregnant women anticipated using a pump to express milk after returning to the workplace. Professionals felt that expected return to work after a short maternity leave dissuaded some women from breastfeeding as women 'don't see it as a feasible option to breastfeed'. However, other professionals questioned how the timing of return to work might affect the effectiveness of breast pumps as an incentive, and whether this might be 'culture specific' depending on differences in statutory maternity leave between different countries:

'In America, a reason for stopping breastfeeding would be because you're going back to work so an electric double-pump would be what you needed. What is standing between you and being able to go back to work still breastfeeding, is £125 worth of double-pump. That might be a really good incentive to carry on past six weeks or three weeks'. (FG9, experts)

Other issues of timing are discussed later.

Table 4. Qualitative study participants

Participants	Number interviewed
Service user involvement mother-and-baby groups	Participants
Aberdeenshire Blackpool	N = 12
	<i>n</i> = 6
	<i>n</i> = 6
Pregnant women and significant others^a	Participants
	N = 68
Pregnant women	<i>n</i> = 6 ^b
Postnatal women	<i>n</i> = 56
Partners and significant others	<i>n</i> = 6
Professionals^a	Participants
	N = 32
Midwifery	<i>n</i> = 8
Health visiting	<i>n</i> = 12
Doctors: paediatricians, obstetricians, GPs	<i>n</i> = 5
Public health	<i>n</i> = 3
Smoking cessation specialists/staff	
Voluntary sector	<i>n</i> = 2
Experts and decision makers^a	<i>n</i> = 12
Public health, maternal and infant health conferences	Participants
	N = ~63
Range of participants per session involving policy, decision-makers, experts and some practitioners	

Data was collected via face-to-face and telephone interviews, and focus groups. A total of 16 focus groups were conducted. At three focus groups with women/recent parents a professional was present and three focus groups were a mixture of professionals and experts. Two women attended two different focus groups, as did two experts (they are counted once only). Two pregnant women were involved in a follow-up postnatal interview (one of whom had an older child at the time of the first interview).

Sharing the load

Breast pumps were seen as a means by which women could find a way of 'sharing the load' of breastfeeding, particularly in relation to sharing night-time feeds with a partner. Participants talked about the sense of restriction stemming from the responsibility of breastfeeding a young baby who needed to feed frequently. Expressing milk was perceived to alleviate this – 'you do get to go off and do your own thing I think, because you have got milk at home' – and it was thought that this could make breastfeeding a more appealing prospect:

'you can have a bit of freedom and other people can do some feeds, so definitely I think that would definitely help people to choose breastfeeding, I think that puts a lot of people off, that they're solely, they feel that they are solely responsible for all that'. (T9, mother, I)

In addition, expressing milk was seen as a way to involve partners or family members in infant care, as feeding was commonly seen as enhancing the relationship between baby and father or grandparent. The option to express milk was also seen to allow others to care for the baby for longer periods:

'As he started going to his grandparents in the day, I actually invested in an electronic one, a double pump one, which has been absolutely brilliant' (5, mother, I)

Potential risks

While breast pumps were discussed by both women and professionals as having the potential to dispel barriers to breastfeeding, some professionals raised concerns that pumps could create barriers. Professionals were anxious to avoid creating the belief that it was necessary to buy equipment in order to breastfeed – 'It's kind of saying that you need a pump to breastfeed' – and that further items such as sterilisers and bottles were necessary once a pump was provided:

'Just giving them the breast pump, well, what do they need to go with that? They need sterilising, they need the steriliser, they need this, they need that' (FG12, professionals)

In a similar vein, some professionals worried that giving women a breast pump added complexity to a situation where women are already learning a new behaviour:

'Is it making breastfeeding a bit complicated if we go and offered a pump whether they needed a pump or not really? (T60, expert)

There were concerns that being given a pump early might be a 'scary' prospect which discourages women from trying breastfeeding 'They've literally just given birth and "Here you go, you need to have one of these".'

Some professionals anticipated that early breast pump use could disrupt the physiological adaptation of maternal milk production to infant milk consumption, and thus negatively impact the establishment of breastfeeding:

So to give them a breast pump you're going to interfere with the actual lactation of breastfeeding process and you're going to create problems for them I think in the early days doing that (FG12, professionals)

Some women with previous experience of using a breast pump noted that they had had little or no instruction in how to use it. This woman reported the problems she had had with a breast pump:

'They never showed me how to use it. I had it on full blast... so... didn't like it so that put me off then I got mastitis. Just one thing after another.' (FG4, mothers)

This points to the need to consider what other intervention components, such as support and information giving, might be needed if breast pumps were provided as an incentive. A few professionals also worried that providing a pump *'could fundamentally undermine hand expression'* which was a skill they encouraged breastfeeding women to learn.

Timing

The timing of breast pump provision was frequently raised as an issue. Participants held varying views on the most appropriate time-point for women to receive a breast pump, in terms of potential benefits or adverse outcomes, and or motivation to maintain breastfeeding. There was much uncertainty about how early during the postpartum period it was appropriate for women to start using a breast pump. Many participants believed that women should *'try and wait till 4 to 6 weeks before you can do that'*, and some professionals felt that women *'shouldn't be pumping in hospitals; they should be hand-expressing at least, you know'*.

Some women considered antenatal provision of a breast pump most desirable, which may relate to the culturally prevalent practice of shopping for a new baby and the emotional comfort derived from being prepared for the baby's arrival. In this view, a breast pump appeared to be seen as part of the necessary tools of infant care:

'Be good to have it beforehand to make sure you have got it. You could give birth at weekend and might not be able to get it straight away' (FG2, mothers)

It was also suggested that being given a breast pump antenatally would *'definitely help people to choose breastfeeding'*, because as discussed above, pumps were seen as a way to lessen the impact of breastfeeding on a woman's daily life. However, some women did not want to consider acquiring a pump until they knew they would use it:

'I've thought there is no point in me looking into now, because if for some reason I start breastfeeding it don't really work out, I will have wasted money on a breastfeeding pump so there is no, you know, there is no point in me getting one at the moment or even thinking about it, I just want to see how it pans out' (5, mother, I)

Others considered that breast pump provision was more appropriate postnatally and could serve as *'a reward for persevering with breastfeeding'*.

Discussion

To our knowledge, this is the first study exploring service user and healthcare provider attitudes to the use of breast pumps as an incentive for breastfeeding. Our mixed methods study found that over two-thirds of health professionals surveyed agreed with offering a breast pump worth £40 provided free by the UK NHS. From qualitative interviews and focus groups with women and professionals, we identified five key themes of the appeal and value of breast pumps, their perceived benefit in terms of reducing barriers to breastfeeding, sharing the load, potential risks and issues related to timing.

A strength of our approach is the service user input and a stratified sampling strategy ensured diversity of participants in the qualitative phase, including those with firsthand experience of receiving or delivering incentives for breastfeeding. We were able to include some harder-to-reach participants in the qualitative research such as mothers under 20 years and participants recruited from areas of social deprivation; however, we may not have reached the most disadvantaged parents as they are likely to have fewer social and health service contacts. The survey of health professionals has limited generalisability because of selection and response biases. Several factors mitigated our obtaining our a priori sample size of 1000 health professionals (Health Technology Assessment Programme H.T.A. 2012), notably the restructuring of the NHS in England in early 2013 when our survey was carried out. Access to email lists to distribute the survey was reliant entirely on email gatekeepers and we were unable to gain comprehensive national access to the required professional groups. Consequently, eligible respondents could have

received the email from more than one source or not at all, and we could not ascertain accurate denominators.

In our research, health professionals had higher net agreement (67.8%) with the incentive strategy of a free breast pump worth £40 than the general public (net agreement 46%) and comparable levels of net disagreement (21.9% and 28%, respectively) (Hoddinott *et al.*, 2014) perhaps reflecting characteristics of the professionals' sample such as higher educational qualifications, which in the general public study was associated with agreement. A UK trial investigating financial incentives for breastfeeding (the NOSH trial) is currently underway, and associated qualitative research reported equivocal views from healthcare professionals (Whelan *et al.* 2014). An analysis of readers' comments on UK news websites following media reporting of the NOSH study reported that most commentators found financial incentives for breastfeeding unacceptable (Giles *et al.* 2015). In our survey of the UK general public, financial incentives were less popular than breast pumps as an incentive for breastfeeding (Hoddinott *et al.*, 2014).

Many of the views on breast pumps as an incentive for breastfeeding reflect the current cultural disposition to breast milk expression and its relationship to breastfeeding. In our study, women viewed breast milk expression and the use of pumps as a key means of involving significant others in the care of their baby. For many mothers, feeding is a nexus in the competing needs of infant, maternal and family wellbeing, and sharing responsibility for feeding is seen as enhancing the relationship between baby and father or other family members (Hoddinott *et al.* 2012; Johnson *et al.* 2013; Leeming *et al.* 2013). Breast milk expression is also seen as a way to bridge the gap between being a 'good mother' and a 'good employee' (Johnson *et al.* 2009). Many women, including some in our study, view breastfeeding as an all-consuming process in which they feel 'trapped'; milk expression is commonly viewed as a way of moderating this (Johnson *et al.* 2009). Thus for many women a breast pump is a desirable commodity, and milk expression seen as an inevitable adjunct to breastfeeding.

There are several unanswered questions to be addressed in considering the use of breast pumps as an incentive for breastfeeding. How the type of pump,

timing of provision and additional intervention components such as instruction, support and problem solving might affect breastfeeding outcomes remains unknown. It is important to understand the effects of breast pump provision on both expressed breast milk feeding and breastfeeding the baby at the breast. In our study, timing of breast pump provision was a key issue with mixed views as to the optimum time to receive a pump and begin expressing. Recent research shows an association between direct feeding at the breast while in hospital (within the first 24–48 h after birth) and continued breastfeeding until 6 months (Forster *et al.* 2015). Both positive (Meehan *et al.* 2008; Win *et al.* 2006) and negative (Geraghty *et al.* 2012; Schwartz *et al.* 2002) associations between breast milk expression and breastfeeding duration have been reported. It is also not known whether smokers' views on breast pumps differ to those of non-smokers; because of the relationship between smoking and infant feeding behaviours, this question would be of interest.

We have previously highlighted the need to consider unintended consequences of incentive provision (Thomson *et al.* 2014). Reported adverse events for breast pumps include pain, discomfort, breast tissue damage and infection, and there is also potential for contamination of expressed milk (Brown *et al.* 2005). Breastfeeding, that is, the feeding of an infant at the breast, and the feeding of breast milk in a bottle, are not equivalent. Infants fed expressed breast milk from a bottle gain weight at a faster rate in the first year of life compared with infants fed at the breast with possible implications for the longer term trajectory of infant and child weight gain (Li *et al.* 2012). Breastfeeding is a relational process (Dykes & Flacking 2010), and breast milk expression and the feeding of breast milk in a bottle are seen by women as both promoting and disrupting connection (Johnson *et al.* 2009; Ryan *et al.* 2013). As well as interpersonal consequences, breast milk expression, especially using a pump, has the potential to increase women's sense that their bodies are like machines and breast milk a product supplied to a consumer (the baby). This may negatively affect maternal confidence and undermine relational aspects of breastfeeding (Dykes 2005; Johnson *et al.* 2009; Ryan *et al.* 2013).

These findings are important because breast pump use is increasing, women buy them even before birth and breast pumps are commonly used in trials of incentives for breastfeeding but evidence for effectiveness is uncertain. Our study found that breast pumps are seen as an item of financial value, are acceptable and are seen as having the potential to overcome barriers to breastfeeding but with some potential risks. Identifying the mechanisms of action for improving breastfeeding outcomes in terms of the type of pump, the timing and the nature of any additional intervention components (e.g. support) is needed, prior to investigating the effectiveness of breast pump incentives.

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Conflict of interest

The authors declare that they have no conflict of interest.

Contributions

NC wrote the first draft of this paper and all co-authors have contributed to the design, analysis and paper writing and meet the ICMJE criteria for authorship. PH led the BIBS study. FD oversaw qualitative data collection and analysis in North West England. NC contributed to the data collection and analysis and assisted with service user co-applicant mother and baby group involvement in Blackpool. GT contributed to the survey design, piloting and reporting of the results and co-ordinated service user co-applicant mother and baby group involvement in Blackpool. HM contributed to the data collection and analysis and co-ordinated service user co-applicant mother and baby group involvement in Aberdeen. GM led the statistical analysis of the survey data and contributed to writing the methods and results sections. MC provided methodological and statistical input to the survey design, analysis and reporting of results.

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